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The efficacy of fat myringoplasty in small central perforation of pars tensa

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ABSTRACT

Background: In the present study, an attempt was made to study the effectiveness of fat graft material and the improvement in hearing following fat myringoplasty in small central perforations of pars tensa.
Methods: This prospective study was carried out in our tertiary centre between October 2014 to October 2015 in 38 patients selected randomly who attended our ENT OPD. Patients with tubotympanic type of chronic suppurative otitis media CSOM (TT), with dry small central perforation involving less than 25% of tympanic membrane (TM) were included. Patients with ossicular fixation or disruption with air bone gap (ABG) >40dB were excluded. All procedures were performed under local anesthesia (LA). Fat graft was harvested from ear lobule and was placed through endomeatal microscopic approach after freshening perforation margin. All patients were followed up to 5months postoperative period and graft status and audiological assessment was made.
Results: In 86.8% cases (33 patients) graft was taken up while in 13.2% cases (5 patients) graft was not taken up. Mean pre-operative air conduction in right/left ear was 28.5±7.6/27.1±8.5 and post-operative was 24.9±5.3/23.4±6.9 dB respectively. Similarly, it was seen that mean pre-operative air bone gap in right/left ear was 17.6±7.2/17.0±7.4 and post-operative was 14.0±5.3/13.2±6 dB respectively.
Conclusions: It is a very safe, simpler procedure and in this we don't disturb the annulus so the chance of lateralization or medialization of graft is nil. During fat myringoplasty the angle of tympanic membrane and anterior recess is maintained in natural position and we don't disturb acoustics, so fat myringoplasty is an excellent option especially for small perforation.

Keywords: Fat graft, CSOM (TT), Small perforation

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a long-standing infection of the middle ear cleft.[1] It affects both sexes and all age groups.[1] Tympanic membrane (TM) perforations lead to recurrent ear infections and hearing loss.[2] The size of perforation has an impact on degree of hearing loss. Wormald has defined the surgical closure of the tympanic membrane perforation without ossicular reconstruction as myringoplasty.[3] Fat is an acceptable material used for small tympanic membrane perforation reconstruction in the literature.[4-9] The purpose of fat myringoplasty in small dry perforation is to restore continuity of tympanic membrane to improve hearing and decrease incidence of middle ear infections. Ringenberg used a fat tympanoplasty for the first time for the closure of a small tympanic membrane perforation in 1962.[10] Fat tissue has been known to have a high capacity of resistance and is used as an autogenous material for different surgeries. In 1997 Mitchell et al used fat in 342

children to close small tympanic membrane perforation and achieved 92% success rate.[11]

Aims and objectives of the study were to find out graft uptake and audiological outcome after fat myringoplasty in small central perforation of pars tensa of TM.

METHODS

This prospective study was approved by ethical committee of our institution and carried out during October 2014 –October 2015, included 38 patients, with dry small central perforation attending the ENT OPD at our tertiary centre and were willing for fat myringoplasty. All patients were informed about the technique before operation and written and informed consent was obtained. The following parameters were evaluated: graft take up, preoperative and postoperative air bone gap (ABG) and morbidity during and after procedure. Pre- and postoperative PTA-ABG was compared using Student's t test.

Inclusion criteria

Tubotympanic (TT) type of CSOM with small central perforation that is involving <25% of TM, with normal appearance of middle ear mucosa, with at least 3 weeks of dry ear patient's with age group – 15-60 years, patients below 15 years were not included as there are high chances of URTI which can affect the study result and patients with <=40 dB ABG on PTA from average of 500, 1000, 2000 and 4000Hz speech frequencies checked for Air conduction and Bone conduction thresholds.

Exclusion criteria

Patients with CSOM atticoantral type or with retraction pocket or with marginal perforation, patients with perforation of pars tensa larger than area of one quadrant and having calcific plaque adjacent to perforation and patients with suspected ossicular discontinuity or fixation and revision surgery.

Preoperative records of all patients regarding age, sex, side, address, and detailed clinical history regarding ear disease were noted. Otoscopy and microscopic examinations of all patients were done and perforation size measured and site was recorded. X-ray mastoid (schuller's view) was done to know the mastoid air cells status. Any allergies, tonsil or sino-nasal problems were treated adequately prior to surgery. An evaluation of hearing was done with full Audiometric and Eustaschian tube function testing. All laboratory preoperative testing was done.

Technique

All procedures were performed under local anesthesia. The ear lobule was infiltrated with 2% Xylocaine with adrenaline and the ear canal wall infiltration was done under microscopic guidance. Incision was given over inferior aspect of ear lobule. Fat graft harvested and put in sterile saline solution until the time of insertion. A single piece of fat, approximately twice the size of the perforation (after refreshing the margins of perforation) or little lesser was harvested taking care not to make a buttonhole on the anterior surface of lobule. Using the operative microscope through endomeatal approach the margin of the perforation was freshened and de-epithelialized using a sickle knife. Small pieces of gel foam were placed in the middle ear through the perforation to support the graft and prevent medial displacement. The fat plug was passed through the perforation and pulled out to evert perforation margins. The one limb of fat graft is divided into two halves this part gets spreads on remnant of tympanic membrane and other limb of fat which is bulky goes inside the middle ear and rest on promontory. Fat graft should remain in contact with all margins of perforation (figure-1: Showing fat graft placement). Small pieces of gel foam soaked in antibiotic solution kept over the graft to support. Small merocele wick soaked in antibiotic cream kept in external auditory canal (EAC). Ear lobule incision was closed in single layer and small dressing was given, no bulky dressing required. All patients were discharged on same day evening with oral antibiotics, decongestants, and analgesics with instructions to keep ear dry, avoid straining and forceful blowing of nose for at least 3 weeks.

Patients were followed up on 7thday, 21st day, 2nd month and 5th month.

On 7th day suture removal was done & merocele removed from EAC. Local antibiotic ear drops were prescribed for 2 weeks. On 21st day follow-up visit otomicroscopy was done to see graft uptake. Postoperative 2nd and 5th month follow-up graft status was checked and PTA was done. Graft uptake was considered as successful criteria while patients with graft rejection or with residual perforation were considered failure. (Figure-2: Graft uptake at 5th month follow-up period). All four frequencies 500, 1000, 2000 and 4000 Hz with air conduction and bone conduction thresholds were recorded and compared with preoperative PTA records in all study patients.

RESULTS

The present study was conducted on 38 cases over a period of 1 year. The gender distribution in the present study was 1:2, 25 were females and 13 were males. The patients were included aged between 15-60 years, with more than 65%patients were between 21-40 years of age. The association between gender and age group and graft uptake was statistically not significant (p >0.05). 28 patients had inferior quadrant perforation while 4 had anterosuperior quadrant perforation and 6 patients had posterosuperior quadrant perforation.

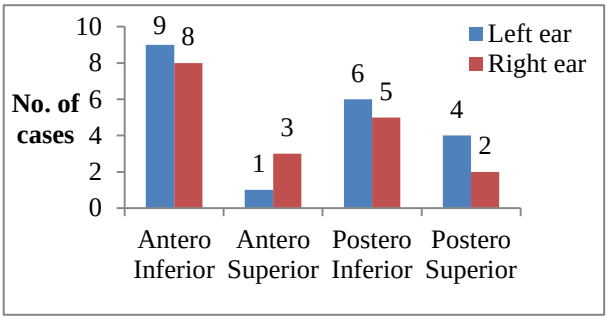

Figure 1: Relationship between operated ear and location of perforation.

In 86.8% cases (33 patients) graft was taken while in 13.2% cases (5 patients) graft was not taken and mean pre-operative air conduction in right ear was 28.5 ± 7.6 and post-operative was 24.9 ± 5.3 while the mean pre-operative air conduction in left ear was 27.1 ± 8.5 and post-operative was 23.4 ± 6.9. Similarly, it was seen that mean pre-operative air bone gap in right ear was 17.6 ± 7.2 and post-operative was 14.0 ± 5.3 while the mean pre-operative air bone gap in left ear was 17.0 ± 7.4 and post-operative was 13.2 ± 6.1. On applying t-test the association between pre-and post-operative values are statistically significant (p<0.0001). Amongst 5 (13.2%) failure, 3 had otomycosis which lead to graft rejection and 2 had residual perforation. All of them were successfully treated with conventional tympanoplasty surgery later.

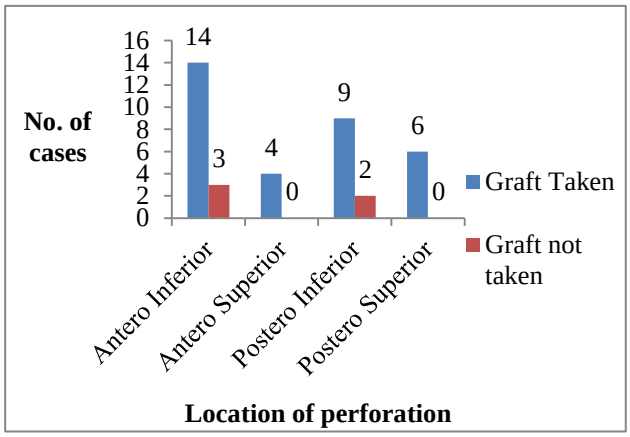

Figure 2: Relationship between graft status and location of perforation.

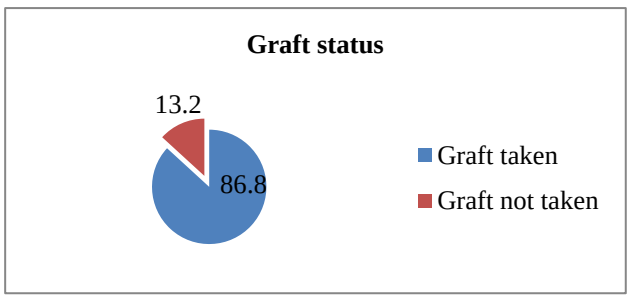

Figure 3: Showing results of graft uptake.

Table 1: Mean difference of preoperative and postoperative air conduction and ABG at 5th month.

Variables	Variable	Mean ± SD	p value
Air conduction (Right ear)	Preoperative	28.5 ± 7.6	< 0.0001
	Postoperative	24.9 ± 5.3	
Air conduction (Left ear)	Preoperative	27.1 ± 8.5	< 0.0001
	Postoperative	23.4 ± 6.9	
Air bone gap (Right ear)	Preoperative	17.6 ± 7.2	< 0.0001
	Postoperative	14.0 ± 5.3	
Air bone gap (Left ear)	Preoperative	17.0 ± 7.4	< 0.0001
	Postoperative	13.2 ± 6.1	

DISCUSSION

It is important to note the property of the fat tissue for the fat tympanoplasty procedure. Although it can be harvested from the abdomen, buttock and ear lobule, the ear lobule fat harvesting is much simpler than the other sites. It can be harvested from the same sterile area of surgical field prepared for the fat tympanoplasty. Its scar is almost invisible as incision is given on the inferior aspect of lobule. The fat of ear lobule is denser and has better epithelial and mucosal tympanic growth. It presents a big revascularization activity as seen by otoscopy a few days after the procedure. There are two histological theories of fat grafts. The host cell replacement theory of Neuhof and the cell survival theory of Peer.[19,20] The host cell replacement theory states that all the original cells die and are totally replaced by new wandering adipocytes or by fibroblasts. The cell survival theory states that not all the original adipose cells die. Those fat cells which receive adequate blood supply survive whereas remaining degenerate, thus explaining loss of volume.

This prospective study was conducted between October 2014 to 0ctober 2015 at our tertiary care centre, in which 38 cases were included for fat myringoplasty. These patients were followed up for a period of 5 months and were evaluated for graft uptake and hearing improvement after fat myringoplasty. In our study, the mean age was 32.57±10.87 years; near about similar to age group reported by Kamakshi.[12] In this age group, there are fewer chances of upper respiratory tract infections and presbyacusis. Shih et al reported a success rate of 54% for children of 10 years and younger compared to 94% for children over 11 years of age.[13] In our study the size of the perforation was the main criteria for fat myringoplasty, similarly it was used by many investigators also to select candidates for fat myrinoplasty. According to Kaddour, the size of the perforation should not exceed 30% of the size of the eardrum (closure rate-80%).[14] Terry et al, who performed fat myringoplasty to correct perforations of various sizes, cited a closure rate of 79.4% if the perforation accounted for <50% of tympanic membrane and 57.1% if the

perforation was larger than that size.[15] In our study, we had chosen ears with a small dry central perforation, which was confined to only one quadrant of the TM. We achieved a successful closure rate of 86.8% which is comparable with the study of Ringenberg. We found a low closure rate for anterior perforations similar to Bertoli et al. study and similar data have not been reported in the literature. The failure rate in our study was 13.2% due to otomycosis in 3 patients and residual perforation in 2 patients. Fiorino and Barbieri described various causes of failures such as anterior perforations, inadequate graft support, poor vascular supply or infection and delayed failures due to atrophic TM, infections, or Eustachian tube dysfunction with change in the TM structure.[6] Fat graft size in relation with the perforation, degree of lateral bulge in the fat plug and moistening of the lateral side of the graft are the important factors for success in the fat grafting procedure as described by Hegazy et al.[16]

Fiorino and Barbieri recorded a slight insignificant improvement in hearing in their 31 patients postoperatively, but with our study as we observed significant decrease in post-operative air conduction than pre-operative air conduction. As the preoperative AB gap was not significantly impaired, in some patients it was within normal limits and hence the postoperative AB gap did not show much of the change. According to literature there is significant bulging on the tympanic membrane till the end of the third month postoperatively and after three months bulging reduced and converted into a smooth sclerotic area on the TM around 5th postoperative month, which was observed in our successful patients also.[9] This bulge and sclerotic plaque can be responsible for bad audiological outcome in large perforations. Kim et al postulated that success rates did not change according to the perforation size, but that patients with large perforations had bad audiological results.[4] Gun et al confirmed the finding that audiological results of the large perforation were worse than small perforation.[17] Dedden, et al found that the size of the perforation is a crucial factor and >30% of the TM perforations have bad prognostic factor for the fat graft.[18]

Other autologous graft material such as temporalis fascia (TF) is widely used material for myringoplasty. TF grafting requires large incision, preparation of tympanomeatal flap and manipulation of middle ear structures, while fat myringoplasty is minimally invasive procedure and avoids middle ear manipulation. It avoids general anesthesia and patient can be discharged on the same day with minimum postoperative care. In fat myringoplasty we don't disturb the annulus and so the acoustics and the angulation of TM are preserved. It is fast, safe, short, cost effective procedure and having comparable results both in terms of success rate and audiological results.

CONCLUSIONS

It is a very safe, simpler procedure and harvesting of fat takes a short time. Fat graft does not need support from the middle ear to prevent collapse like underlay tympanoplasty near the anterior annulus and it avoids middle ear manipulation. In this procedure, we don't disturb the annulus so the chance of lateralization or medialization is nil. During fat myringoplasty the angle of tympanic membrane and anterior recess is maintained in natural position and hence fat myringoplasty is an excellent option especially for small perforations.

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